

IN THE CLAIMS:

- 1 1. (Original) A method for uniformly distributing data transmitted by a server over a plu-
2 rality of underlying links of an aggregate within a computer network, the method com-
3 prising the steps of:
4 defining a unit of data as a datagram;
5 apportioning each datagram into at least one fragment at the server;
6 associating each fragment to an underlying link of the aggregate on the basis of an
7 Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the
8 aggregate; and
9 transmitting the fragment over its associated underlying link from the server to the
10 computer network.
- 1 2. (Original) The method of Claim 1 wherein the step of associating comprises the step of
2 producing a result representing a remainder upon dividing the IP ID by the number of
3 active links.
- 1 3. (Original) The method of Claim 2 wherein the step of associating further comprises the
2 steps of:
3 calculating the IP ID of each datagram in a sequential manner; and
4 rotating the fragments of each datagram among all the underlying links to thereby
5 ensure that all fragments having the same IP ID are provided to the same physical link of
6 the aggregate.
- 1 4. (Original) The method of Claim 1 wherein the step of associating comprises the steps
2 of:
3 logically combining the IP ID with a predetermined mask to produce a quantity;

4 right shifting the quantity a predetermined number of places; and
5 establishing a threshold at which a group of data is forwarded to each underlying
6 link of the aggregate.

1 5. (Original) The method of Claim 4 wherein the step of associating further comprises the
2 step of producing a result representing a remainder upon dividing the right shifted logi-
3 cally combined quantity IP ID and predetermined mask by the number of active links.

1 6. (Original) The method of Claim 5 wherein the IP ID is a 16-bit value, the predeter-
2 mined mask is 0xFF80 and predetermined number of right shifted places is 7, and
3 wherein the group of data comprises 128 IP IDs.

1 7. (Original) The method of Claim 6 wherein the group of data comprises one of 128 dif-
2 ferent transport control protocol (TCP) fragments and 128 different user datagram proto-
3 col (UDP) datagrams.

1 8. (Original) The method of Claim 7 wherein each UDP datagram comprises up to 23
2 fragments.

1 9. (Original) The method of Claim 1 further comprising the steps of:
2 loading at least one data buffer of the server with the at least one fragment;
3 fetching the fragment from the data buffer; and
4 loading at least one queue of the server with the fragment, the queue associated
5 with the underlying link.

1 10. (Original) A system adapted to uniformly distributing data over a plurality of underly-
2 ing links of an aggregate within a computer network, the system comprising:
3 a processor;

4 a memory coupled to the processor and having locations addressable by the proc-
5 essor;

6 an operating system resident in the memory locations and executed by the proces-
7 sor, the operating system configured to implement a modified load balancing technique
8 that defines a unit of data as a datagram, the operating system comprising an Internet Pro-
9 tocol (IP) layer that apportions the datagram into at least one fragment, the operating sys-
10 tem further comprising a virtual interface process that associates the fragment to an un-
11 derlying link of the aggregate on the basis of an IP identifier (ID) of the datagram and a
12 number of active links of the aggregate; and

13 at least one network adapter coupled to the memory and processor that cooperates
14 with a network driver of the operating system to transmit the fragment over the associated
15 underlying link to the computer network.

1 11. (Original) Apparatus for uniformly distributing data transmitted by a server over a
2 plurality of underlying links of an aggregate within a computer network, the apparatus
3 comprising:

4 means for defining a unit of data as a datagram;
5 means for apportioning each datagram into at least one fragment at the server;
6 means for associating each fragment to an underlying link of the aggregate on the
7 basis of an Internet protocol (IP) identifier (ID) of each datagram and a number of active
8 links of the aggregate; and
9 means for transmitting the fragment over its associated underlying link from the
10 server to the computer network.

1 12. (Original) The apparatus of Claim 11 wherein the means for associating comprises
2 means for producing a result representing a remainder upon dividing the IP ID by the
3 number of active links.

1 13. (Original) The apparatus of Claim 12 wherein the means for associating further com-
2 prises:

3 means for calculating the IP ID of each datagram in a sequential manner; and
4 means for rotating the fragments of each datagram among all the underlying links
5 to thereby ensure that all fragments having the same IP ID are provided to the same
6 physical link of the aggregate.

1 14. (Original) The apparatus of Claim 11 wherein the means for associating comprises:
2 means for logically combining the IP ID with a predetermined mask to produce a
3 quantity;

4 means for right shifting the quantity a predetermined number of places; and
5 means for establishing a threshold at which a group of data is forwarded to each
6 underlying link of the aggregate.

1 15. (Original) The apparatus of Claim 14 wherein the means for associating further com-
2 prises means for producing a result representing a remainder upon dividing the right
3 shifted logically combined quantity IP ID and predetermined mask by the number of ac-
4 tive links.

1 16. (Original) A computer readable medium containing executable program instructions
2 for uniformly distributing data transmitted by a server over a plurality of underlying links
3 of an aggregate within a computer network, the executable program instructions compris-
4 ing program instructions for:

5 defining a unit of data as a datagram;
6 apportioning each datagram into at least one fragment at the server;
7 associating each fragment to an underlying link of the aggregate on the basis of an
8 Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the
9 aggregate; and

10 transmitting the fragment over its associated underlying link from the server to the
11 computer network.

1 17. (Original) The computer readable medium of Claim 16 wherein the program instruc-
2 tion for associating comprises a program instruction for producing a result representing a
3 remainder upon dividing the IP ID by the number of active links.

1 18. (Original) The computer readable medium of Claim 17 wherein the program instruc-
2 tion for associating further comprises program instructions for:
3 calculating the IP ID of each datagram in a sequential manner; and
4 rotating the fragments of each datagram among all the underlying links to thereby
5 ensure that all fragments having the same IP ID are provided to the same physical link of
6 the aggregate.

1 19. (Original) The computer readable medium of Claim 16 wherein the program instruc-
2 tion for associating comprises program instructions for:
3 logically combining the IP ID with a predetermined mask to produce a quantity;
4 right shifting the quantity a predetermined number of places; and
5 establishing a threshold at which a group of data is forwarded to each underlying
6 link of the aggregate.

1 20. (Original) The computer readable medium of Claim 19 wherein the program instruc-
2 tion for associating further comprises the program instruction for producing a result rep-
3 resenting a remainder upon dividing the right shifted logically combined quantity IP ID
4 and predetermined mask by the number of active links.